

**Testimony before  
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Chairman Bucshon, Ranking Member Lipinski and members of the Committee, it is a privilege to share with you GE's thoughts on the creation of the Network of Manufacturing Innovation (NNMI) Program and the establishment of Centers for Manufacturing Innovation (CMI). I am Stephan Biller and I serve as GE's Chief Manufacturing Scientist at GE Global Research.

GE Global Research was America's first industrial research lab, established in 1900. For more than 100 years, it has been cornerstone of innovation for GE and proud contributor to a US led manufacturing revolution that helped shape and define the 20<sup>th</sup> century. .

Today, GE's research and development organization is a thriving global enterprise with research centers in every major region of the world. We support every GE business with advanced technology solution that impact a wide range of industry sectors from energy, aviation and transportation to water, healthcare, lighting and appliances. With a global perspective in several industries, we essentially have a front row seat to the challenges and opportunities our businesses face every day to remain competitive in the global economy. It's this firsthand experience and perspective that continually teaches us new lessons on how manufacturers can be competitive. With this context, I'd like to share GE's thoughts on the launching of an NNMI and the critical role such an initiative can play in helping American companies be leaders in the next manufacturing revolution that is rapidly defining the 21<sup>st</sup> century.

## **Launching an NNMI**

Historically and today, innovation has always been one of our nation's greatest assets. But if the US is to be a leader in manufacturing moving forward, the country needs to embrace new trends that are driving manufacturing competitiveness. Future success requires more expansive thinking about how you allocate your funding resources and how you collaborate to drive needed advances.

The U.S. has always been strong in supporting early stage R&D discoveries that have ultimately led to new commercial opportunities. A great example is GE's introduction of the first digital x-ray product in 1999. It was early support from the US government in the basic science behind digital x-ray that kept the technology development moving at a critical juncture of the research program. This paradigm is changing. Today, government support for innovation has to be more targeted, involve more partners and be committed to longer time horizons. For innovations to be implemented by enterprises of all sizes, funding and collaboration needs to continue to a small-scale production level, or later stages of R&D closer to commercialization. Other developed high-wage countries, such as Germany and Japan have long taken such an approach and their current level of manufacturing competitiveness is evidence that such a funding approach is highly beneficial to their societies considering their levels of manufacturing employment. Similarly, the launch of the Network of Manufacturing Innovation (NNMI) would provide an opportunity to significantly improve the competitiveness of U.S. manufacturing.

Fostering public-private partnerships and building shared facilities and infrastructure, the U.S. will be well positioned to redefine its manufacturing infrastructure. To maximize the impact of the National Network for Manufacturing Innovation (NNMI), it is essential to establish a healthy ecosystem of Centers for Manufacturing Innovation (CMI) with participants from academia, government, and industry. We believe that it is paramount to US manufacturing competitiveness that the CMIs help small and medium enterprises (SMEs) introduce novel manufacturing technology into the U.S. manufacturing supply chain more rapidly.

To provide SMES with best possible framework to succeed, we recommend adopting a SEMATECH-like collaboration model that provide broad access to state-of-the-art equipment, draws leadership for CMIs from industry, and leverages CMIs as a training ground to develop an advanced manufacturing workforce. SEMATECH is an ecosystem of private and public players in the broader semiconductor community (device makers, universities, governments, national laboratories, and the entire industry supply chain). Together, they worked to successfully to re-establish U.S. leadership in the semiconductor industry space. Following the SEMATECH model, the NNMI can provide the broad framework that strengthens the U.S. industrial base's position as a global manufacturing leader.

### **GE involvement in NNMI**

At GE, we believe that disruptive innovation often happens at the intersection of technical fields as well as during collaborations between academia, government labs, and enterprises of all sizes. The NNMI provides an ideal framework for these types of intersections and collaborations in manufacturing to flourish and importantly, welcome a larger pool of SMEs that previously have not had the opportunity to participate in these efforts.

Last year, we were pleased when the first innovation institute was established under the National Network for Manufacturing Innovation (NNMI) in additive manufacturing and proud to be an industry partner. Already the National Additive Manufacturing Innovation Institute is beginning to show how big companies like GE can connect and work effectively with small and medium sized enterprises to push new advancements. It underscores the vital importance creating an advanced manufacturing ecosystem that allows SMEs to unleash their practical innovation capability within the CMIs. Such efforts will substantially improve the US-based supply base and domestic innovation.

For SMEs to grow and be globally competitive, they need to understand the market opportunities and technical needs that their products and processes can address. By adopting a SEMATECH-like model for CMIs, SMEs will be able to work in close collaboration with large

industrial enterprises, which source parts or equipment from the SMEs. This will enable SMEs to more efficiently understand the requirements their products must satisfy. And it is with this critical information that SMEs will be able to most efficiently allocate their resources and shorten their development cycles.

Similarly, CMIs can be a great support for advancing promising technology being developed in university research and development labs across the nation. With the increased emphasis universities are placing on technology transfer and commercialization, the CMIs will create a robust pipeline of university-initiated technologies that could be scaled up for insertion into the domestic supply chain.

In addition to being a member of the National Additive Manufacturing Innovation Institute (NAMII), GE also has been participating in the proposals for the three most recently announced institutes. Specifically, GE has partnered with UI Labs in response to the Digital Manufacturing and Design Innovation Institute (DMDI). This institute is of particular importance as it will enable the broad implementation of the digital thread into enterprises of all sizes. We believe the digital thread represents the next big frontier in manufacturing that will revolutionize how product design and manufacturing happens. More collaboration on design and manufacturing processes is happening virtually, which will provide a new degree of access for SMES to become more active participants. The DMDI can help encourage greater SME participation by providing them access to advanced manufacturing digital technology and the opportunity to train their staff in these tools. Only with proficiency in these tools will SMEs be able to stay competitive in product and manufacturing systems design and improve productivity and quality in cooperation with the large enterprises.

Beyond the DMDI, GE also has participated in a New York led consortium being proposed in response to the DOE's Wide Band Gap Semiconductor Institute, as well as teams responding to a recent U.S. Department of Defense (DOD) call to establish a Lightweight and Modern Metals Manufacturing Institute (LM3II).

### **CMI Governance and Technology Transfer**

In the same way that CMIs should draw upon the unique skills of academia, government, and industry, it is equally important for each CMI's governing board to draw its membership from academia, government and industry. When it comes to day-to-day operation, however, the leaders for each institute and a number of their staff should be recruited from private industry, and they should bring demonstrated experience in the insertion of advanced manufacturing technology into production. If the expectation is that each CMI will become self-sufficient, industry will need to see the fruits of its investment manifested in new capabilities. This is particularly important given the stated expectations that private industry should provide up to 50% of the funding to operate the CMIs. Drawing much of the institute's leadership team from industry is the best way to ensure that industry sees the benefit of engagement with CMIs and participates in these institutes on a long-term basis.

### **Strengthening Workforce Skills**

As was pointed out in the NSTC report, 67% of companies surveyed in a recent industry association survey reported a serious shortage in the availability of qualified workers. Many large companies like GE have continued to use apprentice programs to build the skilled workforce of tomorrow. For example, GE Aviation in Lynn, Massachusetts has partnered with North Shore Community College for its apprentice program, and GE Energy in Schenectady, New York has partnered with Hudson Valley Community College's successful Manufacturing Technical Systems program. This program provides trained manufacturing employees to the 19 companies that have partnered with HVCC, and it boasts a 95% placement rate prior to graduation<sup>1</sup>. In addition, GE has partnered with 190 companies to establish the Get Skills to Work program. The program's goal is to train and match 100,000 veterans with jobs by 2015.

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<sup>1</sup> Manufacturing Technical Systems (A.O.S), [www.hvcc.edu/eit/mft/career.html](http://www.hvcc.edu/eit/mft/career.html)

In 2012, GE was able to meet its commitment to hire 1,000 veterans. It is on pace to meet its goal of hiring 5,000 veterans between 2012 and 2016. Today, one of every 13 GE employees in the United States is a veteran.

The skills gap, however, is not limited to producing a production workforce. According to the National Science Foundation, the proportion of the science and engineering workforce older than 50 increased from 18% to 27% between 1993 and 2008. As a result, it is equally important to place emphasis on replenishing the advanced manufacturing researchers that will be necessary to develop tomorrow's technology breakthroughs. The NNMI is an ideal mechanism to create the next generation of skilled innovators, which is critical if the United States is going to continue to be a source of new ideas in the world.

### **Recommendations**

As we think about how best to design the CMIs for broad impact, GE would like to make the following recommendations:

1. Each Center for Manufacturing Innovation (CMI) should focus its efforts toward addressing the fundamental technical barriers that prevent manufacturers from more broadly adopting specific new technologies. To accomplish this, each CMI should adopt an inclusive SEMATECH-like model that includes participants from each part of the manufacturing supply chain.
2. The equipment within a CMI should be made available to all companies so they can conduct manufacturing trials to reduce implementation risks and improve the productivity and competitiveness of their manufacturing operations. At the same time, companies that provide advanced technology equipment to the CMIs should be allowed to count these in-kind contributions toward membership or participation fees. This will ensure that CMIs always have access to state-of-the-art equipment.
3. The advisory boards that provide direction to a CMI should be comprised of individuals from industry, government, and academia, but their leadership teams should be recruited from industry and should have experience in the insertion of advanced manufacturing technology

into production. Additionally, the NNMI should create a mechanism for collaboration, technology transfer, and best practice sharing between CMIs.

4. Working with community colleges and universities, CMIs should provide internships to train the future advanced manufacturing workforce. Furthermore, mechanisms should be created to allow private sector employees to co-locate at CMIs for long-term assignments designed to help them develop additional manufacturing expertise and actively participate in technology development and transition.

### **Conclusion**

The NNMI represents a significant opportunity for the United States to restore its manufacturing prowess and improve its competitiveness. By facilitating partnerships between industry, government, and academia through Centers for Manufacturing Innovation, there is great potential to scale up advanced technologies that are currently in their infancy. General Electric is committed to creating an industrial manufacturing ecosystem by working with other organizations to form CMIs that can help to restore the domestic industrial commons.

Thank you and I look forward to answering any questions.

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